

- (a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a temperature of between 80-100°C and for less than 10 minutes, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4, then
- (b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C for 30-300 minutes, and
- (c) after (b) bleaching the chemical cellulose pulp in a second chlorine dioxide step; and

wherein (a) is further practiced so as to provide a chlorine dioxide dosage of between about 0.1-1.0% active chlorine during the first chlorine dioxide step; and wherein (c) is practiced so as to provide a chlorine dioxide dosage of between about 0.5-2.0% active chlorine during the practice of the second chlorine dioxide step.

REMARKS

Entry of the claim amendments submitted herewith (at least for purpose of appeal should such action become necessary)² and favorable reconsideration and allowance of this application are requested.

By way of the amendment instructions above, the claims have been revised so as to emphasize that the temperature of step a) is performed at between 80-100°C (as compared to WO 91/05909 wherein all Examples are performed at 70°C). Support for such temperature range may be found in the originally filed specification at page 9, lines 5-6.

The wording, "and of minimizing the use of chlorine dioxide" discloses that an object of the present applicants' method is to use chlorine dioxide as a small charge as

possible in every ClO₂ treatment and prevent any harmful chemical reactions. Accordingly, in step a) the charge is chosen so that substantially all ClO₂ will be consumed in this step and substantially no chlorine dioxide is present in step b). The reason for this is that applicants know that hexenuronic acids could react with chlorine dioxide in step b) because of the lower pH and this reaction is not desirable.

Applicants again wish to point out the present claims are directed to a method in which the pulp is treated after cooking and preferably after oxygen delignification in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence. In accordance with the present invention, therefore, the pulp is **not** first treated in (CD)E stages before the D stage as it is done in all examples of WO 91/05909. The kappa number of the pulp after the (CD)E treatment is substantially lower than the kappa number after the cook or even oxygen delignification. For instance, in Table 2, page 14 of WO 91/05909, the kappa after (CD)E is 4.4. The kappa of oxygen delignified pulp is typically 10-14, and in the example of the present application it is 11.9.

The ClO₂ charges disclosed in WO 91/05909 are clearly higher than those in the applicants' present claims. The smallest ClO₂ amount used in WO 91/05909 is 1.05 % as active chlorine (0.4 % as expressed as percentage of chlorine dioxide with respect to pulp; Table 2). The ClO₂ charge in step a) before the acid treatment is below 1.5 % active chlorine.

It also should be noted WO 91/05909 does not teach or suggest the ClO₂ charges for the pulp which is not pretreated in the CD and which have a higher Kappa number than the CD treated pulps. Thus, it clearly should be substantially higher than the charges disclosed by WO 91/05909. In that respect WO 91/05909 teaches against the applicants' invention. Applicants therefore again submit that it is novel and surprising to use such low charges in a first ClO₂ stage as applicants claim.

² A Notice of Appeal is being filed concurrently herewith so as to toll the time period running against this application and to afford the Examiner with sufficient time to consider the amended claims and comments below.

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In closing there is attached hereto a copy of WO 92/13991 which was cited during prosecution of the corresponding Finnish application. An appropriate form PTO-1449 is also attached. Consideration of the same is requested.

In view of the amendments and remarks above, it is suggested that this application is in condition for allowance, and Official Notice to that effect is solicited.

Respectfully submitted,

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APPENDIX I

Marked-Up Version of Amended Claims Pursuant to 37 CFR §1.121(c)

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21. (Three Times Amended) A method of treating chemical cellulose pulp from an alkaline pulping process, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, and of minimizing the use of chlorine dioxide, comprising:

- (a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a temperature over 80-100°C [70 °C] for less than 10 minutes and so as to provide a chlorine dioxide dosage of between 0.5-1.5 % active chlorine, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4; and then
- (b) effecting an acid treatment of the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C and a time of 30-300 minutes sufficient to remove hexenuronic acids from the pulp.

35. (Three Times Amended) A method of treating chemical cellulose pulp from an alkaline pulping process, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, and of minimizing the sue of chlorine dioxide, comprising:

- (a) bleaching the chemical cellulose pulp in a first chlorine dioxide step so that the final pH of the step is over 5, and so as to provide a chlorine dioxide dosage of between about 0.5-1.5 % active chlorine and so that hexenuronic acid groups in the pulp substantially do not react with chlorine dioxide, and for a treatment time of between 30 seconds-three minutes and at a temperature of 80-100°C [over 75 °C]; and then

- (b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C for 30-300 minutes.

39. (Three Times Amended) A method of treating chemical cellulose pulp from an alkaline pulping process, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, comprising:

- (a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a temperature of between 80-100°C [over 70 °C] and for less than 10 minutes, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4, then
- (b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C for 30-300 minutes, and
- (c) after (b) bleaching the chemical cellulose pulp in a second chlorine dioxide step; and

wherein (a) is further practiced so as to provide a chlorine dioxide dosage of between about 0.1-1.0% active chlorine during the first chlorine dioxide step; and wherein (c) is practiced so as to provide a chlorine dioxide dosage of between about 0.5-2.0% active chlorine during the practice of the second chlorine dioxide step.